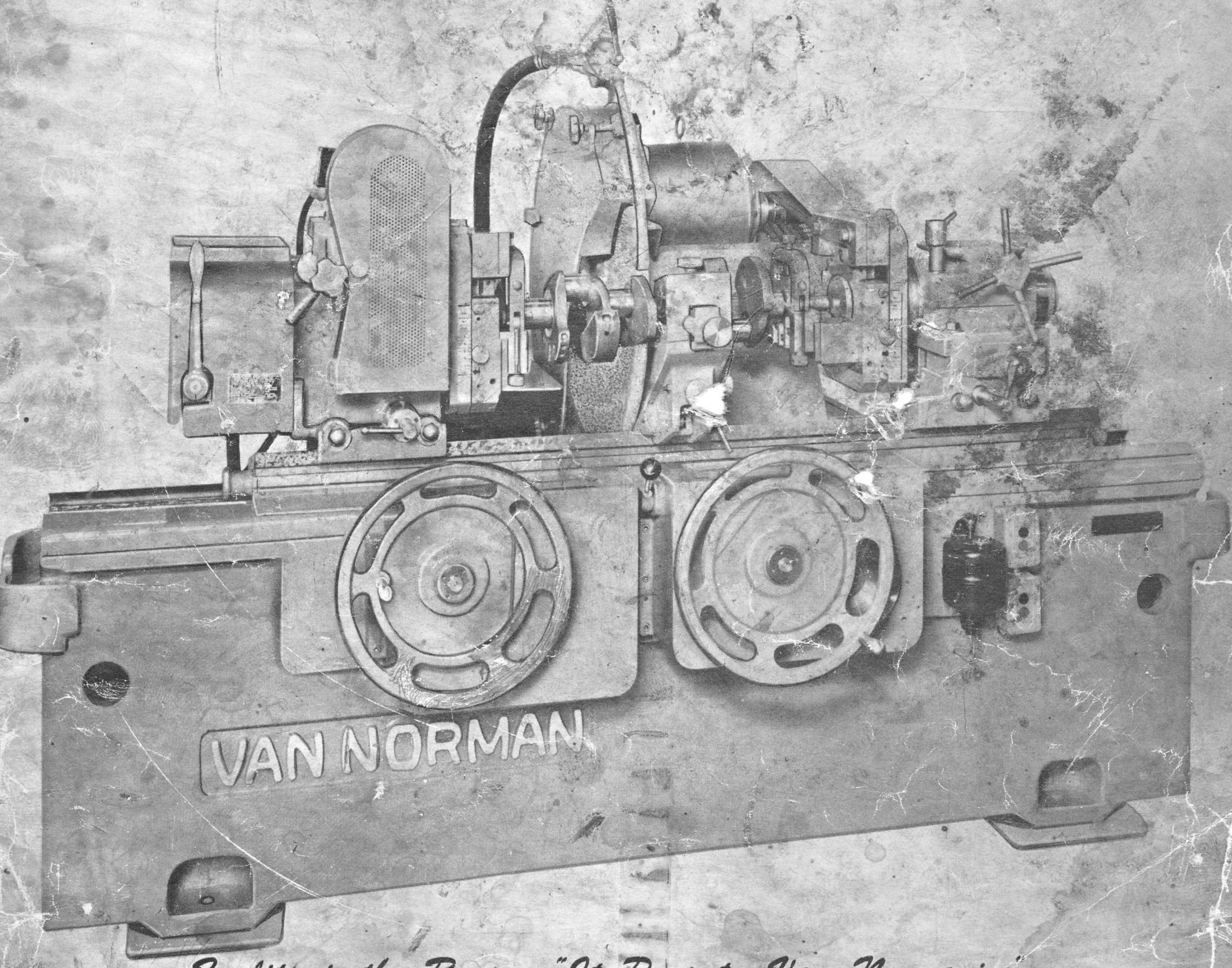
INSTRUCTIONS
FOR CARE AND OPERATION OF
NO. 400 VAN NORMAN CRANKSHAFT RE-GRINDER



Quality is the Reason "It Pays to Van Normanize"

VAN NORMAN COMPANY
Springfield 7, Mass.

SPECIFICATIONS

Distance between centers — 36″.

Maximum Diameter — 18″.

Height from floor to spindle centers — 43″.

Length of machine — 88″.

Work space required — 8′ x 12′.

Abrasive wheels — 28″ x 8″ center.

Workhead speed — 30-60-100 R.P.M.

Tailstock spindle travel — 2″ approximately.

Wheelhead motor — 5 H.P. Dynamically balanced.

Workhead motor — ¾ H.P. Dynamically balanced.

Coolant pump motor — ¼ H.P. Dynamically balanced.

Material — Special machine tool cast iron.

Weight — Net: Approximately 7,400 lbs.

Weight — Boxed for export: Approximately 8,500 lbs.

STANDARD EQUIPMENT

No. 400 Heavy Duty Crankshaft Regrinder, capacity 18″ x 36″ swing, with 220-440 volt, 50-60 cycle, 3-phase motors, with hand crank operated foot stock, water pump, water pump service, set of guards, and set of pulleys, wheel guard, electric push button switches with manual control, overload switch box, and complete set of standard equipment as follows:

1 — Set of Balance Weights.

1 — Set of Wrenches.

1 — Crank Centering Gauge and Indicator.

1 — No. 13848 — 28 x 8 x 1″ Wheel.

1 — No. 666-75002 Center for Wheels including Weights, Flange and Attachment Screws.

1 — Set of Work Drive Dogs.

1 — No. 14567 Diamond Nib.

1 — No. 400-7500 Steady Rest.

3 — Centers.

1 — Gal. Can Grinding Compound.

1 — Set of Operating Instructions.

EXTRA EQUIPMENT AVAILABLE

No. 666-75035 Wheel Balancing Arbor.

No. 111-75500 Wheel Balancing Stand.

No. 14964 — 8″ 3-Jaw Universal Chuck (inside jaw type).

No. 14962 — 8″ 3-Jaw Universal Chuck (outside jaw type).

No. 666-75002 Extra Center for Wheels, includes Weights, Flange and Attachment Screws.

No. 666-75442 Side Wheel Dresser.

No. 16731 Sizing Gauge, with Hydraulic Mounting. Capacity ⅝″-5″.

No. 14434 — 45 Gal. Drum Oakite

No. 400-7500 Steady Rest (1 supplied as standard equipment).

No. 14567 Heavy Duty Diamond Nib.

No. 400-7449 Rapid Action Vee Blocks (headstock).

No. 400-7450 ″ ″ ″ (footstock).

OPERATING INSTRUCTIONS

For Van Norman No. 400 Crankshaft Re-Grinder

★

Capacity: 36 inches in length
Swing: 18 inches
Working Floor Space: 12 feet by 8 feet

★

THE 400 CRANKSHAFT RE-GRINDER is a precision tool built of the best materials obtainable, and to the highest degree of accuracy. Every part of each machine is checked many times during manufacture. If given good care it will produce accurate work for many years to come. A thorough study and application of the information given in this booklet will assist in making this machine more profitable to you.

If questions or problems arise, do not hesitate to contact Van Norman direct, or any of its service men in the field.

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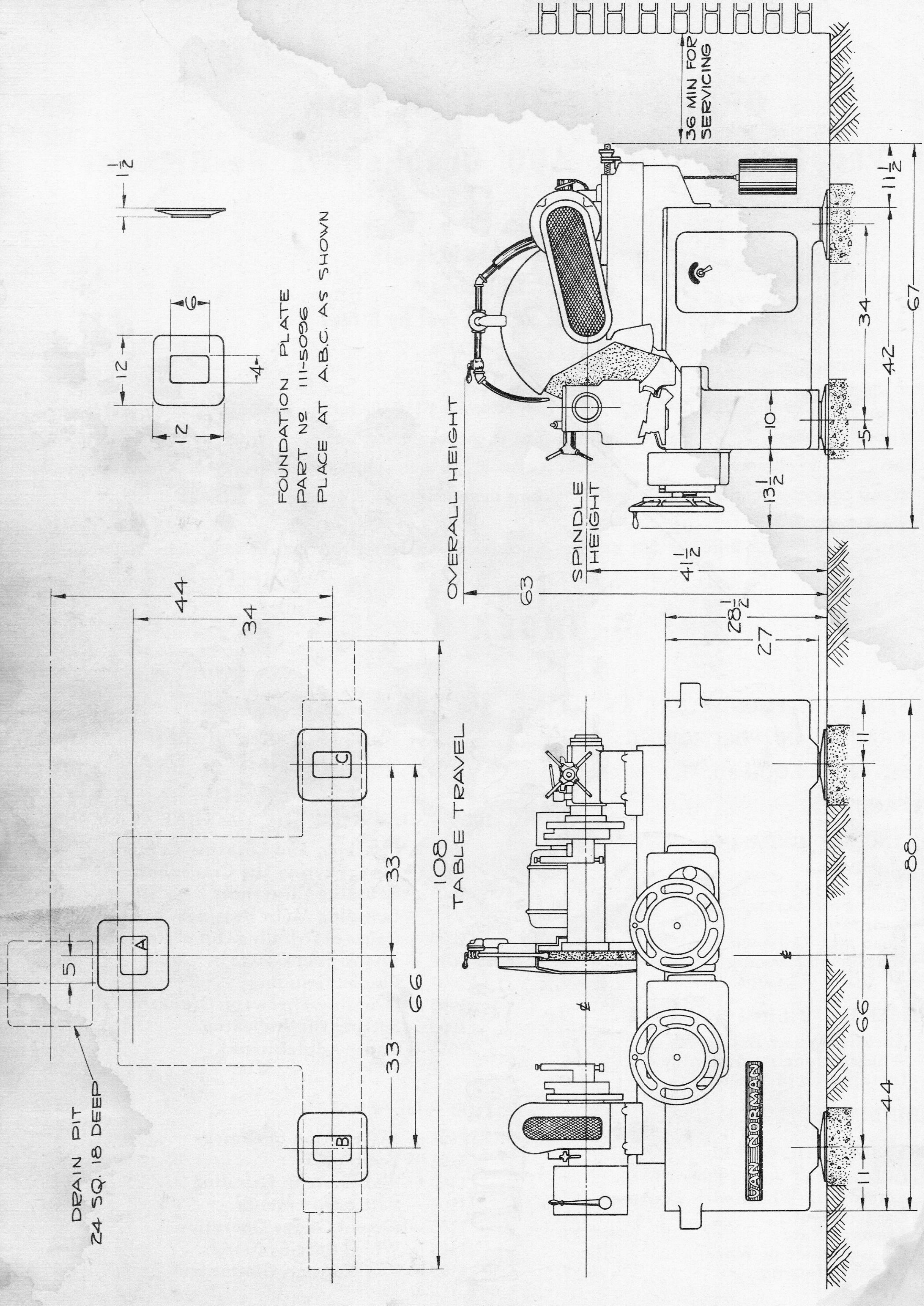


400 INSTALLATION DIMENSIONS

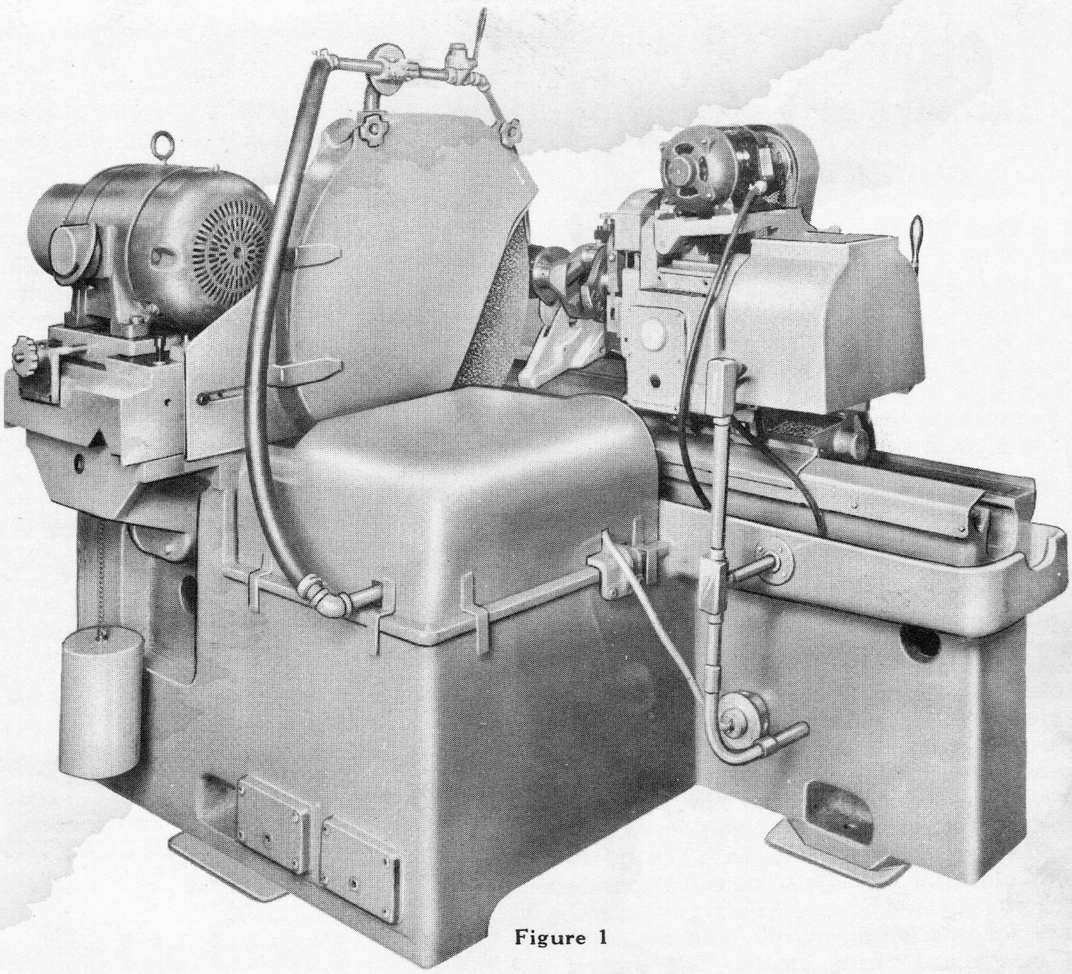


Figure 1

REAR VIEW OF MACHINE SHOWING SUPPORT PADS IN PLACE

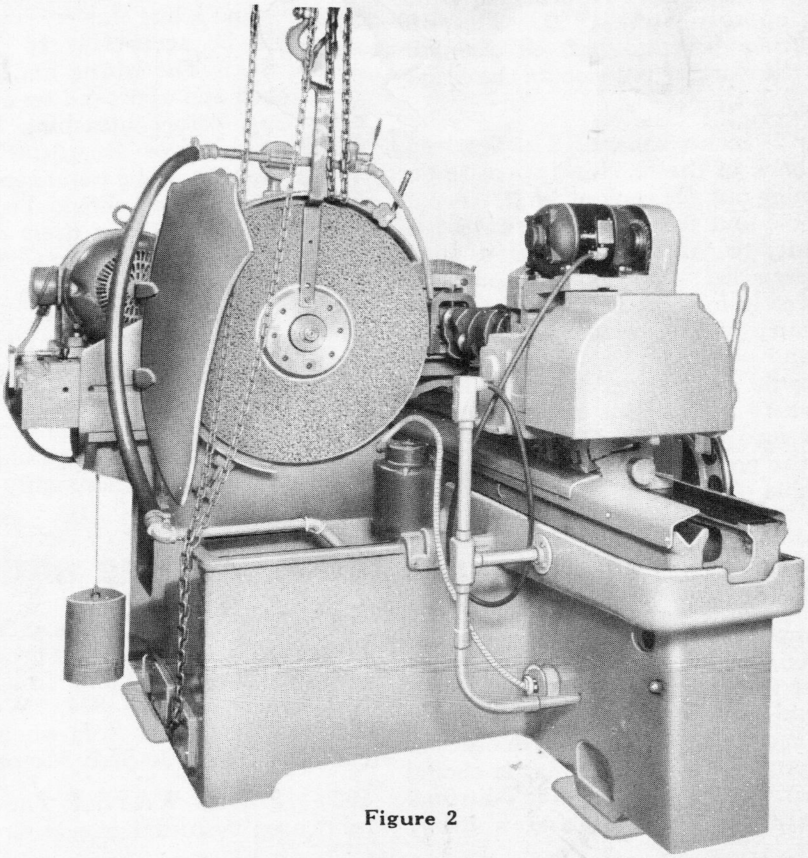


Figure 2

SHOWS LOCATION OF PUMP AND WHEEL BEING REMOVED WITH SPECIAL WHEEL REMOVER (PART NO. 111-5044)

100 . . Support or Foundation Required

A sufficient amount of concrete should be poured to be assured of absolute rigidity without the possibility of settling in a very short length of time. It is recommended that 24 inch depth of concrete, wherever possible, be poured to support the machine. This concrete should be poured to the dimensions shown on Page 2. In cases where it is impractical to pour such a depth of concrete, as much depth of concrete should be poured as is possible in view of existing conditions.

We have seen any number of re-grinders of this type satisfactorily supported on a 6″ depth of concrete provided the concrete is sufficiently wide to prevent crackage at the edges due to the distribution of the crankshaft re-grinder's weight. If only a 6″ depth of concrete is utilized, it should be approximately 8 ft. wide x 14 ft. long.

Extreme caution should be exercised in setting the machine up in such a way that it will not be subjected to the vibrations developed by the passage of heavy-duty trucks and other conveyances. If located on other than the ground floor, the machine should be placed as close to the side of the building as practicable and over building supports or pilasters wherever possible. The question of support for a chainfall should also be given consideration. Crankshafts cannot be satisfactorily installed in the machine for re-grinding by one man without the use of some mechanical lifting means. We suggest a track with chainfall located directly over the wheel of the grinder and extending outward at right angles to the front of the machine, approximately 10 ft. This will provide a means for lifting the crankshaft off of trucks and delivering same to the working position on the crankshaft re-grinder.

A hole approximately 24 inches square, 18 inches deep, should be cast in the back of the machine opposite the holes provided for cleaning out the coolant tank. A pail can be placed in the hole and the coolant permitted to run into the pail in order to carry the coolant to some point where it can be discarded. We do not recommend running the coolant directly into the sewer. There will be a considerable quantity of iron present in the water which might oxidize and possibly close up the sewage system. A location should be provided, possibly in the rear of the building, where the coolant can be dumped and permitted to soak into the soil. Occasionally the residue left on top of the ground can be picked up and deposited in some suitable place.

200 . . Uncrating and Positioning

After removing the upper sections of the crate in which the machine was shipped, it will be necessary to remove the skids in order to set the machine on top of the concrete base, which should have been provided approximately ten days before receipt of the machine in order to permit the concrete to properly set. This matter should be thoroughly discussed, before the machine's arrival, with some local concern capable of taking a heavy machine off the skids and laying the same down gently enough to prevent any possibility of abuse.

The machine should be let down on the three cast-iron pads provided for that purpose and supplied as standard equipment. Setting the machine down on these cast-iron plates requires extreme caution in order to satisfactorily provide the three points on which the machine should rest to be sure of permanent alignment. These pads should be located as shown on Page 2.

A level should be utilized to set the machine up as nearly level as possible. Shims can be made from tin or other thin sections of metal to obtain the proper alignment. Under no circumstances should wood be used as it has a tendency to swell, compress, or in other ways act unfavorably to the retainment of the levelling which assists materially in controlling the oil flow on both the table and wheelhead slides. Toe jacks should be used which locate under the lower edge of the machine, permitting lifting of the machine sufficiently slowly to install shims when necessary.

The water pump and feed screw counter weight is installed as shown on Page 3.

REMOVE THE STEEL STRAPS WHICH LOCK THE WHEEL CROSS SLIDE TO THE BASE OF THE MACHINE BEFORE ATTEMPTING TO ROTATE HANDWHEELS CONTROLLING MOVEMENT OF WHEEL CROSS SLIDE.

300 . . Electrical Equipment

This machine is completely equipped with overload switches and a line starter, and to the best of our knowledge will be acceptable to your local electrical code authorities. The wiring and switches, however, should be checked and approved by a competent, local, licensed electrician before attaching main service lines. Any additional devices or special wiring required by local authorities should be purchased locally. A record of the fuses in these boxes should be made and extra fuses purchased locally to have them available in case of emergency. The Van Norman Company does not have fuses available for resale.

400 . . Cleaning

Remove all anti-rust compound with cleansing solvent or kerosene. (*Do not use gasoline.*) **Caution** — Be sure to clean table ways thoroughly before moving them.

500 . . Oiling and Greasing

501 — MOTORS — In most cases motors are of the ball-bearing type and should be greased once a year with ball-bearing grease, available from Van Norman Company under part number 13874. We reserve the right to supply bushing type motors when desired which should be oiled daily with 30-SAE Motor Oil.

502 — TABLE WAYS — The ways of the machine are lubricated by means of a Bijur manually controlled system which lubricates both the wheelhead slide and the main table ways. In order to be assured of proper lubrication, an EXTREME PRESSURE LUBRICANT similar to URSA-X10 (sold at all Texaco bulk stations), as manufactured by the Texaco Company, must be used. We cannot overemphasize the importance of refraining from using any other type of lubricant at this point. Satisfactory lubrication of the machine ways will be obtained by lifting up the handle on the Bijur reservoir on the front of the machine approximately once every eight hours of operation. The handle is merely lifted up as far as possible. The spring with which the device is equipped with then force the handle downwards into the reservoir and pump in the oil to both the cross slide and table traverse ways. Check Bijur reservoir and refill weekly.

503 — **CROSS FEED SCREW** — The cross feed screw mechanism operates in a bath of 50-SAE Motor Oil. The wheelhead can be traversed to its farthest backward position and oil poured into the feed screw well through an opening which will appear directly in front of the wheelhead bearing assembly after the front guard has been removed. Oiling at this point will not be necessary any oftener than two or three times a year provided no leaks are present. The oil should be kept at a height sufficient to assure the feed screw proper lubrication. It will be obvious from observation when this height of oil level has been reached.

504 — **GEAR BOXES** — The table and wheel traverse gear boxes on the front of the machine should be kept filled to the height of the oil level plugs on the front side of the gear boxes with 50-SAE oil. Add additional oil by removing screw on top of the gear boxes.

505 — **HEAD AND TAILSTOCK** — Both the headstock and tailstock which are equipped with Timken bearings, have been packed with Andock C lubricant. A sufficient amount of lubrication has been introduced to take care of all lubrication requirements for approximately six months. Approximately every six months, two or three additional ounces of Andock C should be added to both the workhead and tailstock. This lubricant can be purchased from the Standard Oil Company of New Jersey or the Colonial Beacon Company. All other nationally recognized lubricating companies have lubricants of a comparable nature which can be supplied for lubricating both the workhead and tailstock. It should be borne in mind, however, that any deviation from this type of lubrication will result in unsatisfactory performance. Headstock worm box — Fill to oil level with heavy worm gear lubricant similar to 650T Mineral Oil or heavy motor oil.

A large screw is assembled in the bottom of the tray found on the top of the tailstock of the machine. This large screw should be removed. Underneath will be found a second screw which, if removed, will permit introduction of the desired lubrication directly into the tailstock quill twice yearly.

Caution: ALWAYS THOROUGHLY WIPE OFF ALL SURROUNDING PORTIONS OF THE MACHINE BEFORE REMOVING SCREW IN ORDER TO INTRODUCE LUBRICANT.

The headstock lubrication is taken care of by introducing ANDOK-C Lubricant through two grease fittings on front side of workhead. Grease twice a year; add only 2 or 3 ounces.

506 — **Caution:** TWO GREASE FITTINGS ARE LOCATED ON THE TOP OF THE WHEELHEAD HOUSING. BEFORE ATTEMPTING TO INSTALL GREASE AT THIS POINT, THE GREASE FITTINGS SHOULD BE THOROUGHLY WIPED OFF AND ONLY THE EQUIVALENT OF ONE OUNCE OF GREASE ADDED EVERY SIX MONTHS TO EACH FITTING. Do not add excessive grease at this point or heat will be developed which is detrimental to the quality of grind this type of precision SKF roller bearing is capable of producing. Two-ounce tubes of a special grease are available under part number 13874.

507 — **ALL OTHER OIL CUPS** — All oil cups on the machine can be lubricated with Motor Oil of No. 10 to 30 SAE viscosity.

600 . . Wheel Balancing

601 — **ABRASIVE WHEEL BALANCING** — Out of roundness, vibration, chatter, and poor finish can in many cases be traced to an improperly balanced abrasive wheel.

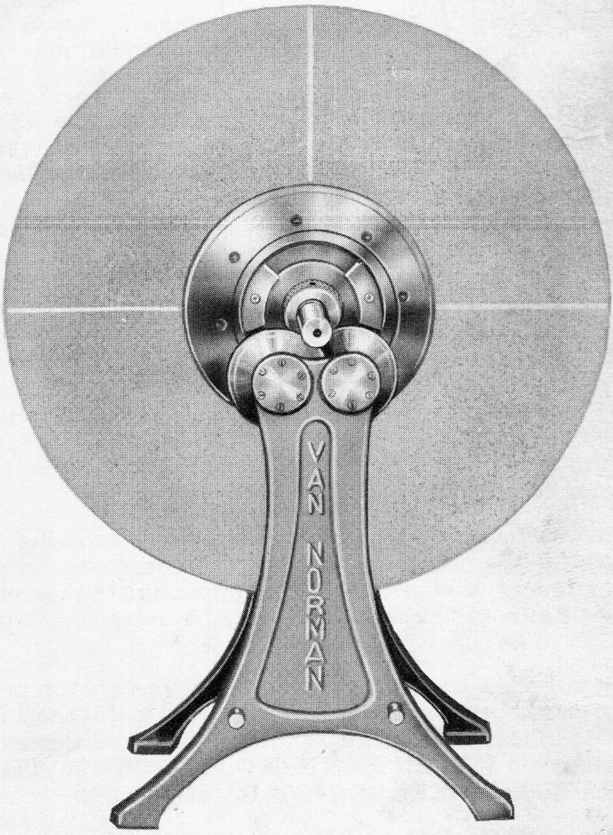


Figure 3

Fig. 3 shows an abrasive wheel set up to be balanced. A horizontal line has been drawn on the face of the wheel

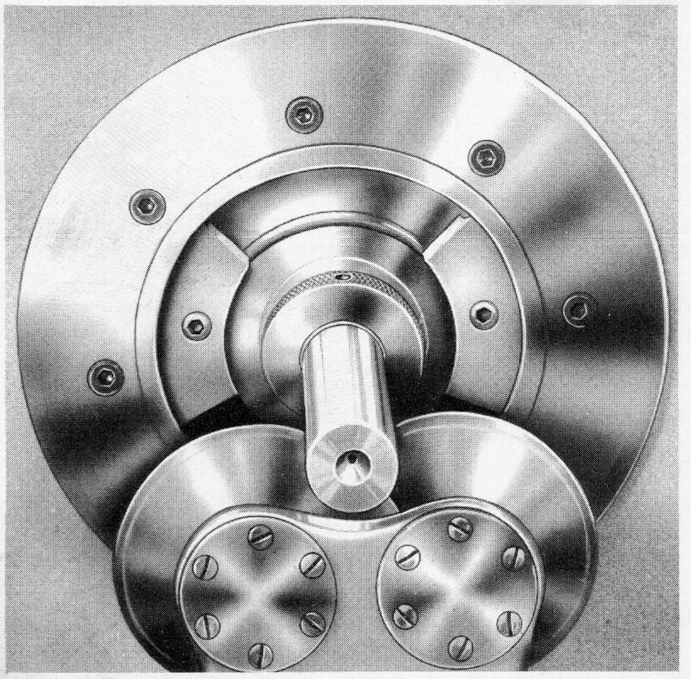


Figure 4

with chalk after the wheel comes to rest. A vertical line has also been drawn showing the lightest side of the wheel. This is for reference purposes and indicates that the heaviest side of the wheel has come to rest on the bottom. The two balancing weights should now be inserted exactly in the center of the horizontal lines.

If this has been done properly, the balance of the wheel has not been changed. The center of the screws in the balancing weights should be directly opposite the horizontal line which has been drawn on the face of the wheel. In order to balance the wheel, it will be necessary to add weight on the side of the wheel having the vertical line. In order to do this, move both the weights the same identical amount around towards the vertical line. The wheel should now be rotated and allowed to come to rest. If the weights have been moved an insufficient amount, the vertical line will come to rest in the same vertical position. Again move the weights an equal distance in the same direction. When they have been moved the proper amount, the wheel will come to rest in any position, indicating balance has been obtained.

Securely lock the weights in position as shown in Fig. 4, preventing the possibility of their becoming loose during the grinding operation. After approximately every one-half inch of wheel wear, it may be necessary to rebalance to be sure of vibrationless operation.

Do not allow coolant to pour on to a wheel not in motion, or one side will become saturated with coolant, making it heavy and acting as though the wheel were out of balance. NEVER USE COOLANT WHEN THE ABRASIVE WHEEL IS NOT IN MOTION.

602 — WHEEL BALANCING ASSEMBLY — Fig. 5 shows the balancing arbor which is used in conjunction with the balancing machine. The flanges and wheel centers, as also shown in Fig. 5, should be available for different sizes and types of wheels. Once installed, the flanges and wheel centers should not be removed until the wheel has been used up, eliminating the necessity of going through the balancing procedure every time a wheel is changed on the machine. Two weights, as shown in Fig. 4 are supplied as standard equipment with every set of flanges and wheel centers.

The use of excessive pressure on the eight screws holding the two halves of the wheel center or flanges together against the abrasive wheel will cause them to dish or spring. Excessive pressure is the basic cause for most broken wheels. Do not hammer on Allen screw wrench in finally locking screws into position.

Always try to insert a .001 feeler gauge between flange and paper blotter or washer after locking the abrasive wheel into position. If the flange is sprung and the feeler gauge can be inserted, remove the flanges and remachine perfectly flat. The inner flange can be locked on to the balancing arbor and faced in a lathe. The outside flange can be surface ground or trued up in a chuck on a lathe and faced.

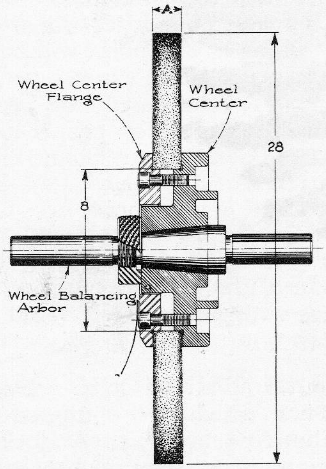


Figure 5

603 — INSTALLATION OF WHEEL — When the wheel is first received it should be carefully inspected for cracks. If none are apparent the wheel should be held up vertically and tapped lightly. If the wheel is all right it will ring. If not okay there will be a dull sound. If cracks show or the tap test shows the wheel defective, report it immediately to the wheel supplier and your transportation company. If the wheel checks okay, carefully install it in the wheel center, using the proper blotters. Do not excessively tighten the wheel center as the strain may cause breakage. Wheel suppliers will not be responsible for wheel breakage after you place it on the center.

Special wheel support attached to chain fall as shown in Fig. 2 can be obtained from Van Norman under part No. 111-5044.

700 . . Grinding Solution

The selection of a proper grinding solution has a definite bearing on the quality of finish obtained. Too greasy or heavy a grinding solution will cause the wheel to load too rapidly and decrease the ability of the coolant to conduct the heat set up by the grinding action away from the surface being ground.

A one-gallon can of coolant is supplied as standard equipment. This, however, is only a sample. There are hundreds of coolant compounds available, all of which have their supposedly favorable characteristics. It would be our suggestion that a local representative of one of these many companies be contacted in the interests of acquiring a satisfactory coolant in sufficient quantities to have it available at all times, or order from Van Norman Company, Springfield, Mass., in 50-Gal. Drum. The finish obtained on the crankshaft will be governed to a considerable extent by the cleanliness of the coolant used. Old dirty coolant is not only a health hazard, but is generally harmful for many other reasons. Coolant should be replaced often enough to be assured that reasonably clean coolant is delivered to the wheel at all times. If the compound used has a tendency to foam, we would suggest the addition of a small quantity of kerosene to the coolant water. Approximately one pint of kerosene curbs objectionable conditions of this kind occasionally encountered with some coolant compounds.

800 . . Dressing the Wheel

801 — DRESSING THE WHEEL FACE — One of the most important features in connection with crankshaft re-grinding is the dressing of the wheel face. Always dress the wheel after installing it on the machine even though it may not have been removed from the wheel centers. Diamond is held in back side of vertical slide of footstock at (A), Fig. 9.

There are innumerable methods of wheel dressings, the proper combination of which are only acquired by practice. Sharp diamonds, slow passage of the diamond across the wheel, and the area of the diamond which contacts the work are all factors which control the quality of finish obtained from any grinder.

Coolant should always be used on the diamond during the dressing operation. Friction set up by the abrasive wheel in contact with the diamond very rapidly develops heat which will cause the diamond holder to expand, as well as the possibility that the brazing holding the diamond in position in its holder will be loosened.

802 — CONTACTING WHEEL WITH DIAMOND — The wheel usually wears on the edges, leaving high spots in the center. At the start of the dressing operation, the diamond point is brought into contact with the wheel, while wheel is rotating, at the high spot to prevent an excessive cut which would be taken if the wheel were contacted on the outer edges.

803 — DEPTH OF CUT — The diamond should never be fed into the wheel more than two thousandths of an inch per pass in order to minimize breakage of the diamond. The depth of cut also controls the finish imparted to the wheel; a light cut producing a fine finish and a heavy cut breaks out the abrasive grain to give a coarser cutting action.

804 — TRAVERSE RATE — A fast rate of traverse across the wheel increases wear on the diamond. A fast rate is also objectionable since a spiral groove, known as diamond marks, is generated. To produce a fine finish, the traverse rate should be slow, but if too slow, glazing of the wheel will occur. The rate must be determined by trial for each type of wheel and application.

It should be borne in mind that in traversing the diamond by the wheel, theoretically a thread is cut in the face of the wheel. This thread is of the right hand type when the table is fed to the left, and upon reversing the table traverse, a left hand thread is cut on the periphery of the wheel. A 28″ diameter wheel has a circumference of approximately 90″. During the dressing operation, the diamond must cover every particle of this circumference. The wheel traverses at 860 R.P.M. If this surface is to be satisfactorily dressed, a definite length of time must be consumed which cannot be hastened if satisfactory finish is to be obtained.

The wheel, when satisfactorily dressed, should feel smooth and velvet like when the thumb is held against the rotating wheel.

805 — DRESSING SIDE OF WHEEL — There are occasions when it will be found that the sides of the wheels do not run true. In cases of this nature, the diamond can be held in one of the chucks which are available and the wheel traversed by the diamond point the necessary distance to be sure that when the sides of the wheel encounter the cheeks of the crankshaft, only a smooth grinding action will take place. If it is found necessary to dress the sides of the wheel, the wheel should be removed, re-balanced, and then re-dressed again to be sure of vibration free rotation.

A special side wheel dresser is available under part No. 666-75442. See page 15, Fig. 16 & 17.

Note: After installing the abrasive wheel on the spindle, always rotate by hand to be sure that no interference exists between the wheel guard and wheel.

806 — RADIUS DRESSING — A radius is usually required on the corners of the wheel. This can be acquired by holding an abrasive stick against the side of the wheel and dressing or forming the desired radius. This radius can be checked by forcing a piece of cardboard into the front face of the wheel. In this way a template of the wheel's shape will be acquired and it can then be definitely determined as to whether the radius which has been dressed on to the corner of the wheel is satisfactory. It should be understood that the radius to which the wheel corners are dressed should be slightly smaller than the radius originally ground into the crankshaft. It is only in this way that the surface can be made to clean up on the crankshaft.

Considerable controversy exists as to whether or not the fillets found in a crankshaft are to be duplicated. This of course is a question which can only be answered by the man who designed the crankshaft in question. From the practical side of the picture, we must consider that thousands of crankshafts are reground and then metallized. To complete this operation, one hundred thousandths of an inch is ordinarily removed from the crankshaft before re-grinding. This operation removes a large part of the fillets previously ground on the shaft.

Shafts having been ground in this manner have operated for hundreds of thousands of miles and in many cases have out-performed the originally ground crankshaft. Therefore, it is our opinion that duplicating the fillet contour is not only unnecessary but extremely expensive as well as decreasing the life of the abrasive wheel considerably. It should be understood that this is only an opinion and is not to be construed as a method which should be used. We wish to further add that this opinion is only presented after talking with hundreds of crankshaft re-grinders who base their opinion on practical experience. The distinct recommendations of the crankshaft builders themselves should be respected at all times if there is any doubt present.

900 . . Workhead

901 — WORKHEAD CLUTCH — The rear clutching mechanism on the extreme left end of the workhead is of the **DRY TYPE** and should not be lubricated under any circumstances. To acquire additional tension or to increase the pulling power of the clutch, place a screw driver under the spring band found in the center of the clutch. Lifting out the end of this spring band will permit rotating the knurled ring a sufficient amount to acquire the proper load-carrying capacity. After making adjustment, snap the end of steel band back into position. Do not attempt to make too great an adjustment on the initial try. A small movement of approximately one-fifth of a revolution of the knurled ring may be sufficient.

Caution: IN OPERATING THE MACHINE, DO NOT JAM WORKHEAD CLUTCH INTO POSITION WHEN STARTING. If the workhead is started up too suddenly, there is a possibility that the tailstock will be unable to follow the rotating motion set up by the workhead. This causes the crankshaft to revolve in either the holding dogs or chucks (whichever are being used), creating misalignment. Proper operation is obtained by bringing the clutch gently into contact. Getting the crankshaft into rotation slowly assures positive drive and retainment of relation between the holding devices and the crankshaft.

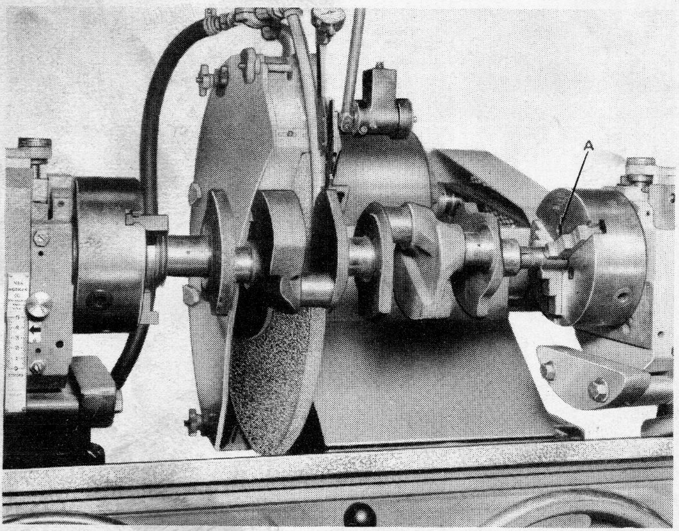


Figure 6

902 — WORKHEAD SPEEDS — The proper workhead speed should now be selected for the crankshaft to be reground. The machine is equipped with three workhead speeds: 30, 60, and 100 R.P.M. A speed should be selected which will eliminate vibration in cases where the crankshaft balancing devices have been removed. Under ordinary circumstances, the 60 R.P.M. speed will usually suffice. Any vibration developed by too fast a rotation will be transmitted to the work with the attendant out of round and unsatisfactory finish.

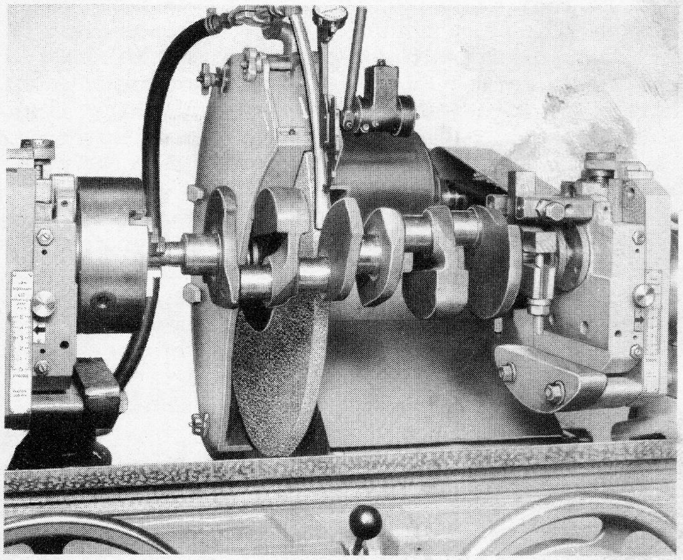


Figure 7

In the past crankshafts have been ground by various methods, all of which are supposed to have had their particular advantage. In designing the 400 machine, we have tried to make available as many of these methods as possible without destroying the efficiency and rigidity of the machine.

In the following pages we will show the various setups which can be obtained and which we believe will eliminate any objections to crankshaft re-grinding which may have been experienced in the past.

Illustration 6 shows a crankshaft setup on the 400 machine being held by means of two heavy-duty 8″ chucks. This is the most commonly used type of setup. It will be noted that because of the construction and design of the machine that the chucks can be removed by taking out the three screws found on the face of each chuck at (a).

Illustration 7 shows a crankshaft being ground by means of the chuck and center combination. It will be noted that the small or timing gear end of the crankshaft is being held in the chuck while the opposite or flywheel end is permitted to rest on a center while being held by a driving dog. This method is used by many operators as it has been found from practice that the center in the crankshaft on the flywheel end is usually in satisfactory condition and has not been damaged as is so often the case on the timing gear end. Many operators use wheel pullers to remove the timing gear which are supported during the gear removal operation on the center of the crankshaft in such a way that its accuracy is destroyed.

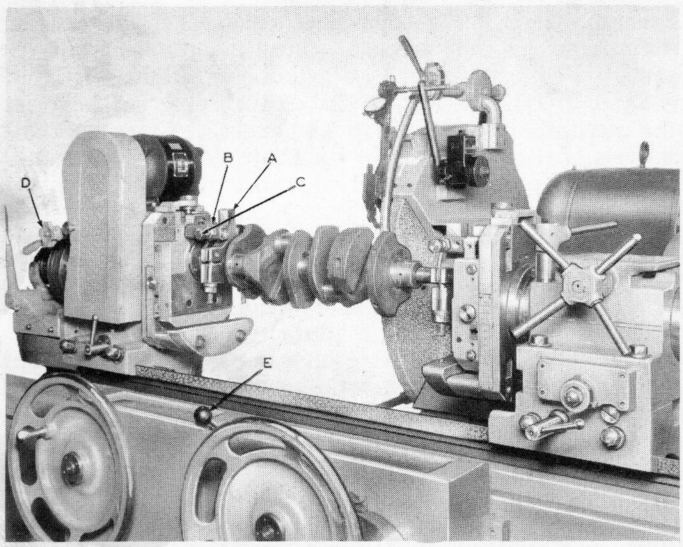


Figure 8

Illustration 8 shows a crankshaft setup for grinding of throws supported by centers on both ends. The driving dogs which must be attached to the crankshaft before installation in the machine are being used for driving purposes. As the center in the timing gear end of the shaft is used in this case, it should be checked.

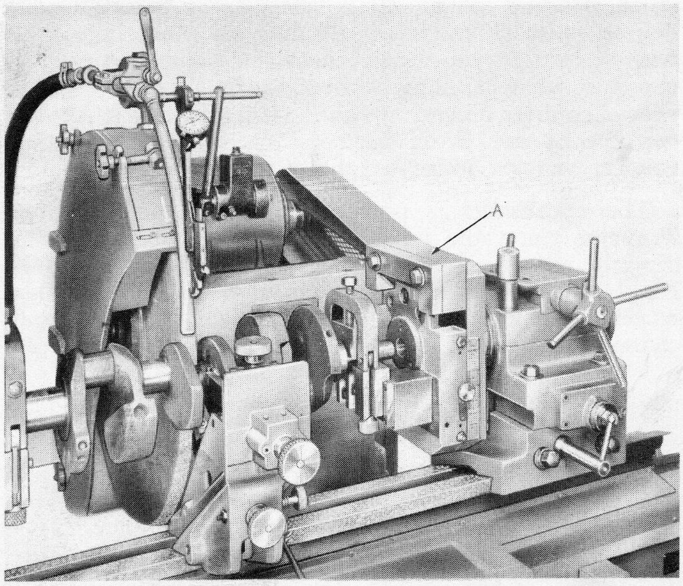


Figure 9

Illustration 9 shows the vee block principle being used. This method utilizes the outside diameter of the flywheel flange under the timing gear. This method eliminates any question relative to the condition of the centers as they are not used and the crankshaft can be ground to extremely close tolerances for concentricity. The vee block devices are so designed that they can be locked in position, permitting almost absolute concentricity of the crankshaft bearings previously to re-grinding. In other words, it is unnecessary to work from worn surfaces as is the case when the crankshaft must be re-centered and it is an accepted fact that the flywheel flange is held to extremely close tolerances on its diameter.

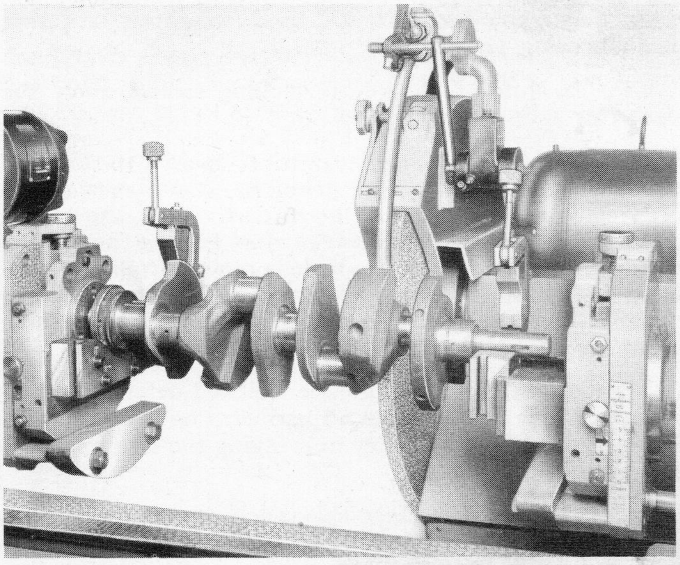


Figure 10

Illustration 10 shows the holding dogs or gripping devices which are lifted up and out of the way in order to reload the machine for grinding.

Considerable time is saved by this method in that the crankshaft is merely dropped into the vee blocks rather than attempting to lock the shaft in between chuck jaws or attaching driving dogs as used in illustration 8.

These vee blocks are designed primarily for use in grinding Ford, Chevrolet and Plymouth shafts.

It will be noted that the vee block devices are held on with four screws and can be removed in a few minutes, permitting use of any of the other methods as outlined and shown in illustrations

1000 . . Checking Machine

1001 — CHECKING AND LOCATING CENTERS — A taper shank center should be installed in the hole in the face plate on both workhead and tailstock, after which the indicator stand as shown in Fig. 13 should be placed against the center. When rotating the entire head, the center should check within .002 for concentricity. If it is found that the center is rotating improperly, it is possible to re-correct by loosening the large end of the gib at (A), Fig. 13 and tightening the screw on the opposite end of the gib. This will force the taper gib down into the slide and cause the center to move forward towards the operator or the low side of the indicator reading before having been moved. If it is necessary to move the slide in the opposite direction, the procedure outlined above is reversed. Only one gib has to be moved in this manner as the opposite gib is of a type which is locked into position while using the knob shown as (D) Fig. 13.

Should there be any error in the up and down direction the slide can be moved in the proper direction by rotating screw (B), Fig. 13. It is considered advisable if the vertical screw has been moved to reset the dial on the vertical screw to zero when the desired concentricity has been obtained. After making all necessary corrections and being assured that the centers rotate in a concentric or satisfactory manner, either the chucks or center method previously explained can be used to obtain accurate main bearing grinding.

Two revolutions of the gib locking screws move the center or slide sideways .001.

Both headstock and tailstock must operate in this true running condition. When grinding main bearings no attempt whatsoever should be made to favor the crankshaft or get the shaft to run true after getting the centers rotating concentric. If the slide is moved from this concentric position, the main bearings will be ground eccentrically to either the timing gear location or the outside diameter of the flywheel flange.

The centers should always be checked before grinding main bearings and if proper adjustments have been made, there should be no difficulty in bringing the centers into a true running condition.

Before leaving our plant this machine was thoroughly checked for both alignment and runout. Abuse, vibration and other conditions encountered in modern transportation may slightly distort any type of precision equipment. Always double-check all alignments before attempting to grind for the first time. It is a good plan to anticipate spending several hours going over the machine after it has been set up to be sure that no damage has taken place and so that if claims are to be made to the transportation company, they can be placed immediately to facilitate prompt settlement for such claims for damage.

NOTE: Any surface produced on the outside diameter of a crankshaft or other type of shaft, will be an absolute duplicate of the center on which the piece revolves. If we are to grind on centers, the shaft centers must be either in good condition beyond any question or it should be re-centered in a lathe which should be available for that purpose. Timing gear or camshaft vibration can in many cases be attributed to the practice of some operators of grinding a shaft on badly deformed centers.

1002 — RE-CENTERING THE CRANKSHAFT — Whenever possible when re-centering the crankshaft, use the surface directly under the timing gear for the location point of the re-centering equipment. Always use the outside diameter of the flywheel locating flange on the opposite end of the crankshaft for re-centering purpose. In many cases, it will be found possible to locate the steady rest on an unworn portion on the extreme end of one of the main bearing surfaces. Any attempt to use the badly worn, out of round part of the main bearing, will only cause difficulty as the relation between the main bearing and the timing gear location will be destroyed. In the case of the flywheel end of the shaft, we have seen cases where considerable vibration was built up during the operation of the motor which could be attributed to re-centering the shaft from the worn portion of the main bearing. Re-centering from the outside diameter of the flywheel flange on a crankshaft makes it unnecessary to re-grind the sides of the flange and will guarantee duplication and retainment of the relation between flywheel and main bearing.

1003 — GRINDING CLEARANCES — A thorough understanding should exist between the customer and re-grinder as to what is meant relative to "size." Many operators follow the tolerances set up by the bearing manufacturers and grind required clearances from the shaft. For example: A 4″ diameter shaft might be ground to 1.998 minus .0005 but in boring the bearings the mechanic would bore to 2.00 exact. There are other schools of thought wherein the shaft would be ground to exactly 2″ and the desired clearance removed from the bearings proper. This condition should be understood between the consumer and the re-grinder before actually finishing the crankshafts.

We have found that following the procedure outlined by the numerous bearing manufacturers seems to be the more reliable and has more or less become an accepted method. The bearing manufacturer feels that in making the bearings to standard dimensions, they have eliminated considerable confusion as the re-grinder can acquire any clearance on the bearings that he feels necessary be merely decreasing the diameter of the shaft.

1004—GRINDING MAIN BEARINGS—Place Crankshaft between centers until center of tailstock is in contact with centers in crankshaft. A generous supply of white lead or litharge and oil should be used on the tailstock center to decrease wear and friction set up by the rotating crankshaft against the center. The driving dog should be attached as shown Fig. 8. Do not attempt to securely lock tail of the dog in driving blocks (B). Two or three thousandths clearance between ends of screws and tail of driving dog is entirely satisfactory when grinding mains. It is unnecessary to use driving dog on tailstock end when grinding main bearings. We wish to caution you, however, at this point that no play can exist when grinding connecting rod bearings. Attach special counter balance weight to top of slide if chucks or vee blocks are being used. Attach extra weight to counter-balance added weight of chucks.

The crankshaft is now in position for re-grinding. Traverse the table until the bearing to be ground is directly opposite the grinding wheel. Pull lever (G), Fig. 11, forward to engage high speed wheel travel. When wheel is about 3/8″ away from surface to be ground, change position of lever (G) into slow or micro feed.

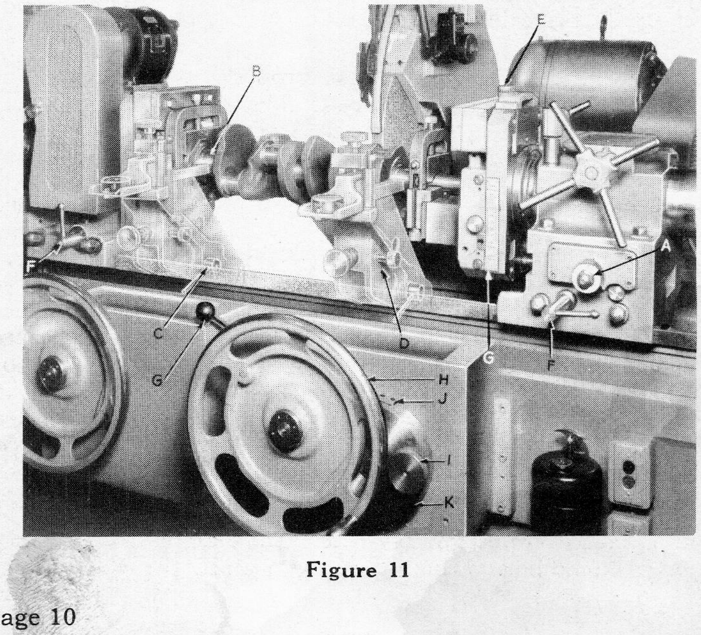


Figure 11

Push down on right-hand side of sizing stop (H), Fig. 11. Slightly tighten knob (I), Fig. 11. Now feed into work with wheel until size has been acquired. Stop (J) will be in contact with sizing stop (H). Re-tighten knob (I) and machine will be set to size for balance of bearings of the same size. To locate the abrasive wheel for the next bearing, engage lever (G) in high speed. Run abrasive wheel away from work. The operator should count the turns when backing off away from the work. For example: If 5 turns are required to get the abrasive wheel back far enough to obtain clearance to traverse to next bearing, it will be apparent that if the operator feeds in four turns at high speed and then engages the slow speed traverse, it will be unnecessary to bend over and watch the abrasive wheel approach the work as the stop (J) will be starting to approach position stop (H) which determines finish size.

Directly ahead of the graduation on the size control handwheel (K) is a second set of graduations, 50 in number. The numbers are what we call anticipators. The anticipator is merely a group of numbers which, if used, will permit the operator to know as to whether or not the surface being ground is going to clean up in a pre-determined number of thousandths.

For example, let us assume that there is .010 to be removed from the surface to be ground. If, when the wheel contacts the work, the anticipator graduation 30 is closest to the handwheel stop, it will indicate that the amount which must be removed to clean up is at least .030. The operator can then stop and if grinding on throws adjustments can be made to permit cleaning up with a smaller amount. If this condition exists when grinding main bearings, there is nothing that can be done except possibly to straighten the crankshaft.

In grinding the middle main bearing, it is desirable to use a steady rest to control deflection and to eliminate chatter and out of round conditions.

In cases where longer shafts are encountered, it is considered advisable to use two steady rests to hold all of the main bearings concentric, and in line. In cases of this nature additional steady rests are suggested and can be used to decided advantage.

In order to use the steady rest properly, a definite technique must be acquired which is obtained only after considerable practice. Wide wheels, improperly dressed wheels and loaded wheels all create excessive pressure and have a tendency to spring the crankshaft, which must be offset with steady rest pressure. As these pressures or springing tendencies vary, it is quite apparent that the operator must learn to feel this resistance and at all times keep the steady rest in a position which does not spring the shaft and at the same time absorbs the pressure of the wheel.

In grinding round surfaces, it is considered good practice not to use the steady rest until the wheel has cleaned up the entire surface on the journal being ground, it being assumed that because the crankshaft is being rotated, the wheel will grind an absolute concentric and round surface. Unfortunately, the crankshaft is not as rigid as it should be and the pressures set up by the wheel vary so greatly that a compromise must be made and it is necessary to bring the steady rest in contact with the work after it has cleaned up approximately ¾ of the way around. The part of the crankshaft surface which has not cleaned up will make it possible for the operator to force the steady rest in against this surface as it is smaller in diameter. Then when the higher or larger diameter surface contacts the steady rest it will force the crankshaft into the wheel and spring the bearings out of line.

With the explanation above understood clearly, it will be appreciated what is meant by the technique which is necessary to obtain satisfactory results.

A positive check as to whether or not too much pressure is being applied can be ascertained by backing off the steady rest during grinding operation and then note as to whether or not the micrometer handwheel can be fed in several thousandths before the wheel again contacts the work. If the crankshaft has been sprung, it will actually be ground smaller than it would normally be were it allowed to rotate concentric with the machine centers.

Many times operators explain that there is a "sag" existing in the crankshaft and after re-grinding it, is still there. There is no way that we know of for checking a crankshaft "sag" as it is quite obvious that the "sag" would exist in a downward position at all times. And will not register on the indicator when the shaft is rotated.

1005 — CAUSE OF GRINDING OUT OF ROUND — Out of round of the surface being ground is controlled almost 100% by the tension of the steady rest shoe against the rotating surface. This out of round condition can best be controlled and the proper tension acquired by utilizing gauge similar to the Arnold Gauge available as extra equipment on the 400 machine. With the Arnold type of gauge in contact with the surface being ground, the indicator at all times shows when it is approaching the size and whether there is a taper or out of round condition existent. To check for taper, locate the indicator on one end of the throw, then lift off the bearing surface and slide the gauge along to the opposite side of the steady rest and re-engage on the crankshaft. In this way out of round and taper are definitely shown.

1006 — THE ARNOLD GAUGE — The Arnold type of gauge in our estimation definitely decreases the grinding time in determining diameters. Savings as high as 30% are to be expected in the time consumed as the operator does not find it necessary to stop the machine and measure for size. In this way it is possible for management to check the quality of work without actually stopping the machine to check the work itself during grinding operations. The Arnold gauge with its large, clear indicator face, shows at all times what quality of work is being produced on the machine.

1007 — PLUNGE GRINDING — Many operators prefer an abrasive wheel exactly the same width as the surface being ground. This is entirely satisfactory with the understanding that exceptionally wide wheels will become glazed more rapidly and tend to deform the crankshaft and make the use of a steady rest an extremely difficult operation. Wheels approximately ¾ the width of the surface being ground permit rapid plunge grinding to size. These wheels also cut much faster as there is less tendency of the crankshaft springing during the grinding operation, and permits an operator to position the wheel with less difficulty. After plunge cutting, the operator should always traverse the wheel across the entire surface to eliminate any lines or marks developed during the plunging process. We would suggest allowing .0005 for this cross-traverse grinding as a final operation. The wheel should be fed across the bearing surface very slowly to prevent burning or discoloring the surface being ground. Always have a generous supply of coolant flowing on to the surface being ground to assist further in preventing burning. If all these precautions are taken and discoloring persists, the abrasive wheel should be re-dressed as it is either loaded or has been dressed too smooth. Do not turn off coolant with abrasive wheel in contact with work or out of round shafts will be produced.

1008 — GRINDING THE THROWS ON CRANKSHAFTS — The 400 machine utilizes what we believe is the fastest method by means of which a crankshaft can be set up for re-grinding. We further believe that in grinding both the crank pins and the main bearings from the same location and on the same center, provides us with parallel ground surfaces to a greater degree of accuracy than can be obtained by any other method. If required, chucks or vee blocks can be supplied. In grinding on centers, there is considerably less weight to offset; therefore fewer counter-balances are used with the attendant possibility of an out of balance condition existing which might cause the development of out of round surface being ground.

In utilizing the centers for grinding throws, a driving dog must be used on each end of the crankshaft. It is suggested that these dogs be placed on the crankshaft before placing it into the machine. They should, however, only be locked very loosely on to the crankshaft as an adjustment will be necessary during the final setup and operation before re-grinding.

It is suggested that brass bushings be slipped over the ground surface on the crankshaft to prevent the driving dogs from marring the previously ground surface.

The next operation is to determine the stroke of the crankshaft to be re-ground. Reference to a bearing manual or catalog will usually suffice. If this information is not available, measure the distance from the center line of one main bearing to the center line of the connecting rod surface to be ground. Twice this distance is the stroke of the engine.

The index pins rigidly locating the vertical slides should now be engaged by rotating the levers (F), Fig. 11.

In order to clarify our instructions, we will assume that a 6″ stroke crankshaft is to be ground. This means that the indicators on the sides of the offset heads (G), Fig. 11, should read 6″ when the heads are properly located off-center. The feed screws with which the offset heads are equipped are 8 pitch. This means 8 revolutions of the feed screw for 1″ of travel. As the distance which we must off-set the heads is one-half of the stroke, we will rotate the screw exactly 24 turns, bringing the indicator point on the top of the offset head to zero. It should be borne in mind at this time that no grinding can be done at any time unless the graduations on both offset heads read identically the same, provided they read the same when grinding the mains. Any attempt to move one head higher than the opposite end will permit grinding bearing surfaces which are not parallel with the main bearings.

When the desired height or offset has been acquired, the driving dogs, if being used, should be securely locked on the crankshaft. No play should exist between the tail of the driving dog (A), Fig. 8, and the driving post screws (C), Fig. 8. Weights should now be attached to the offset slides to acquire balance during grinding of crank pins. Practice alone will determine how much weight is required. If it is necessary to use an unequal number of weights, the extra weight should always be placed on the workhead end.

When the proper balance has been acquired, it will be possible to rotate the entire assembly of crankshaft and workheads with the clutch disengaged and have it in balance. This is extremely important, particularly at high speeds. If the crankshaft has not been properly balanced, it will be noted that during the grinding operation the grinding spark will have a distinct flutter and it will be impossible for the operator to make the spark uniform, irrespective of the tension applied to the steady rest adjusting screws. If in doubt, go back and re-check for balance.

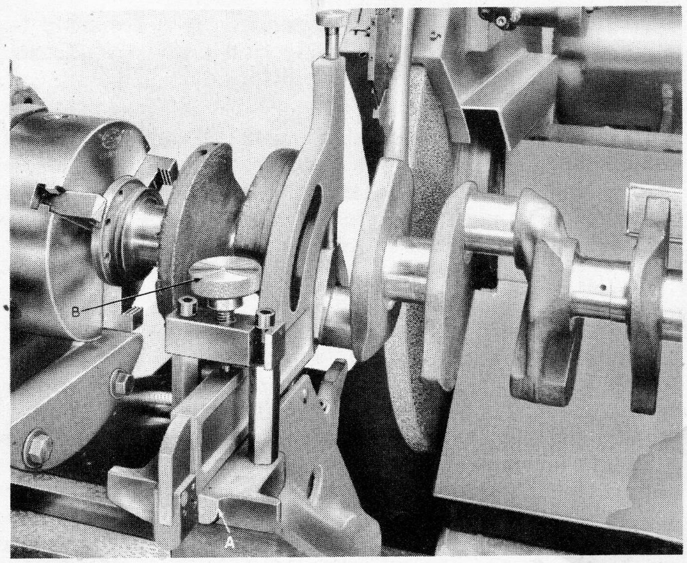


Figure 12

The steady rest should now be placed on the machine opposite the throw it is desired to grind. Place the V-gauge on top of the steady rest as shown in Fig. 12. Rotate the crankshaft backwards and forward until the V-gauge has settled into position. It will be determined by experience when the throw has been properly located which is an approximate true running position.

Note: Before attempting to use this V-gauge, it is suggested that the stop (A) be checked by placing the V-gauge on a crankshaft which has been ground on the main bearings. As the crankshaft is running true in this position, the stop can be set so that the V-gauge contacts both sides of the crankshaft with the stop (A) in contact with the end of the steady rest.

The tail of the dog should now be locked into position by rotating the square end of the adjusting screws (B), Fig. 8, without any excessive tension being applied. The large hexagon nuts should now be checked into place so that when the crankshaft is rotated there will be no possibility of the driving dogs acquiring any play or movement which would effect the very accurate setup for runout which must now be made.

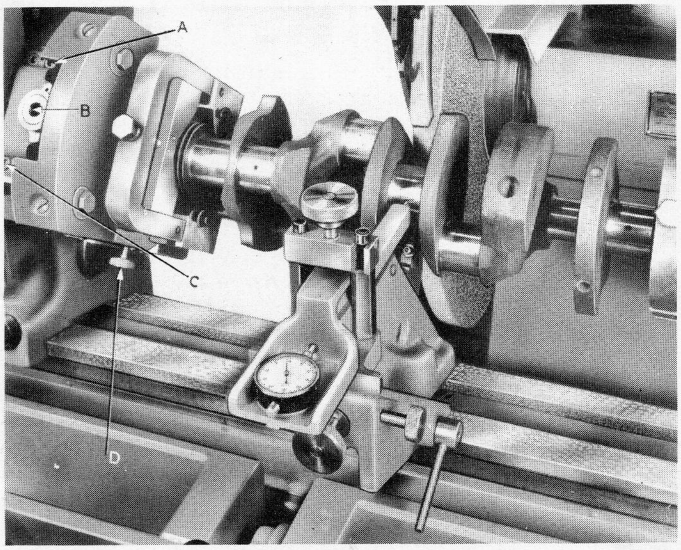


Figure 13

1009 — SETTING THE INDICATOR — Release the lock which holds the V-gauge in position by swinging the top lever (B), Fig. 12, out of the way. Place indicator as shown in Fig. 13 in contact with the surface to be ground. Remove the two index pins locking headstock and tailstock vertical slides in position (F), Fig. 11. With clutch on workhead disengaged, rotate driving head 90° so that top of slide having indicator collar is pointed towards the back of the machine. Bring indicator point into contact with bearing to be ground. A sufficient amount of tension on indicator should be obtained to acquire approximately one revolution of indicator needle. Rotate face of dial of indicator so that needle points to zero. Now rotate heads 180° until the graduated dial at top of slide points towards operator. The reading of the indicator will now show the exact amount which the throw is off-center in an upward and downward position. Both dials on each end of the vertical slides should now be moved exactly one-half of this amount, keeping in mind that both dials should read exactly the same when the adjustment has been made.

If the crankshaft is running within a few thousandths vertically you are now in a position to check for sideways runout. This is accomplished by turning the crankshaft and slides until the indicator dials on the vertical slides point sideways. Bring the indicator into contact with the bearing and correct the dial to read zero on the indicator. Now rotate the crankshaft exactly 180°. One-half of the amount which the indicator points from zero is the amount which the crankshaft must be moved sideways to acquire a true running position. This is almost invariably only a few thousandths if instructions have been followed very carefully. The screws locking the tail of the driving dogs in position can now be loosened. Rotate either one of the two screws on the headstock end (C), Fig. 8, the desired amount to acquire the desired reading on the dial indicator. The index pins must be engaged when making this adjustment. When this has been accomplished, bring both screws (C), Fig. 8, into contact with the tail of the driving dog and lock in this position by tightening down the hexagon nuts. In locking the tailstock dog on the opposite end, extreme care must be exercised in bringing the points of these adjusting screws into contact with the driving dog. Too much tension can distort the relation of the headstock to the tailstock producing a condition which will cause vibration during grinding.

Caution: DO NOT ATTEMPT TO TIGHTEN DOWN THE LARGE SCREWS WHICH CLAMP THE TWO HALVES OF THE DRIVING DOG TO THE CRANKSHAFT AFTER MAKING THE ADJUSTMENT WITH THE UPPER SCREWS ON THE DRIVING DOG TAIL.

There are two V's on each half of the driving dog. In tightening down these two halves, the dogs have a tendency to creep around the shaft causing distortion and throwing the headstock out of time with the tailstock. It is considered good practice to attempt to re-engage index pins on both the headstock and tailstock to check for possible creep of the dogs when they were finally locked on the crankshaft. If it is found that you are unable to re-engage both index pins very easily, it will be necessary to loosen up the screws holding the tail of the driving dog, re-engage the index pins, and re-adjust to eliminate the distortion which has crept into the set-up operation. If this operation has been done satisfactorily, the workhead and tailstock are now in time and the crankshaft can be rotated with the dial indicator in contact with the bearing to be ground and it should run extremely close.

To grind the next connecting rod bearing, lock vertical slides in position, then place indicator in steady rest with a slight pressure on indicator against bearing just ground. Set indicator at zero. Now place steady rest opposite the next bearing to be ground. Loosen four screws which lock the driving dog to crankshaft and rotate shaft till journal to be ground contacts indicator and indicator again reads zero less ½ the amount ground from previous bearing. Unlock vertical slides and recheck for final adjustment.

Upon indicating the crankshaft it may be found that the crankshaft no longer runs true in an up and down position. This in many cases will be found to be due to a spring in the crankshaft which while of a minor amount, will prevent cleaning up with a very small removal of material. We recommend moving both headstock and tailstock vertical slides a sufficient amount to permit the crankshaft to run true. This affects the stroke of the engine the amount which the vertical slides were moved. We do not consider this objectionable and it is to be preferred rather than grinding an excessive amount off of the crankshaft bearing. It should be distinctly understood at this point, however, that both the headstock and tailstock should be moved the same identical amount to be assured that the connecting rod surface is being ground parallel to the main bearing. THERE IS NO EXCEPTION TO THIS RULE. The balance of the throws are ground in the same identical manner and we again caution you in cases where there is any question, to re-engage the index pins in the vertical position and if they do not enter freely, loosen up the driving dogs and re-adjust to eliminate the twist which has been put in the shaft.

Chucks or vee blocks can be attached to this machine. The crankshaft can be rotated after loosening the chucks and the indicator used for setting up the various throws to be ground in the same rapid manner as outlined above.

1010 — TAPER ADJUSTMENT — In moving the tailstock to accommodate various lengths of crankshafts there is a possibility that alignment between headstock and tailstock may be effected. To check for alignment, proceed as follows:

Lock the steady rest to the table with the indicator point directly opposite and in contact with the main bearing on the extreme left hand end of the machine, it being assumed that the centers are running true on both the headstock and the tailstock. Set the dial indicator to read zero. With the indicator still locked to the steady rest, disengage the lever (C), Fig. 11, and re-locate the steady rest directly opposite the main bearing on the extreme opposite end of the crankshaft. If both bearings on the crankshaft are the same diameter, you will now have an indicator reading of the amount of misalignment which exists. To make correction, loosen up the four screws which hold the upper section of the tailstock in position. By means of the graduated knob the tailstock is moved the amount of variation between the reading of the headstock and tailstock. For example: Let us assume that the indicator which reads zero on the workhead end now reads .010″ when in contact with the bearing of the crankshaft at the tailstock end. Rotate the dial knob until the indicator reads zero. This method makes it possible to instantaneously correct for taper. Fig. 11 shows phantom view of indicator in two positions.

1100 . . General

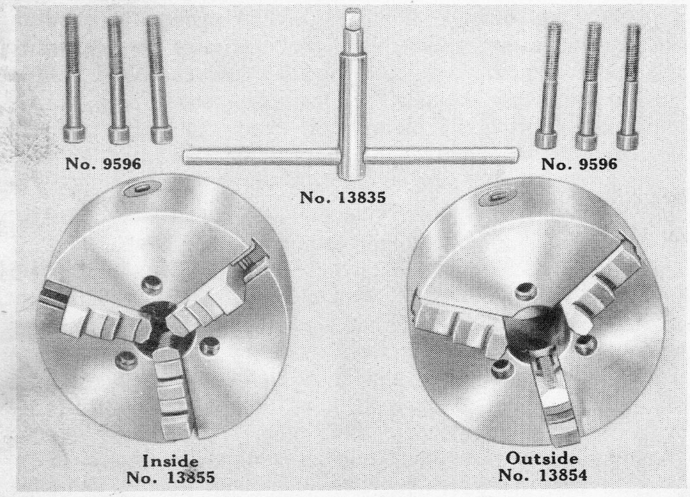


Figure 14

1101 — INSTALLATION OF CHUCKS — Some operators prefer to use chucks on some shafts. Chucks are available at extra cost and are installed on the head or footstock chuck mounts provided for this purpose. Figure 14 shows inside and outside chucks.

1102 — VEE BLOCKS — Vee blocks as shown in Fig. 6 are also available.

1103 — FLAT SPOTS IN GRINDING — If flat spots are developed during grinding, they can be attributed most often to two conditions. Either the workhead belts are slipping or the workhead driving clutch is not adjusted with sufficient pulling power. Always check these two points first if experiencing difficulty in connection with the development of flat spots during the operation. Out of round in most cases is caused by insufficient coolant during grinding. The more coolant used the rounder the shaft will be.

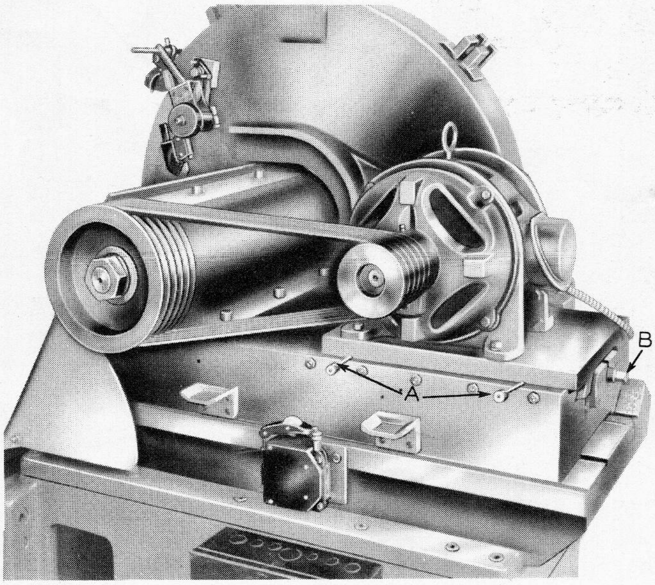


Figure 15

1104 — BELT ADJUSTMENTS — To tighten main wheel drive belts, loosen binder screws (A), Fig. 15, tighten by rotating shaft (B). Keep all belts tight. Always use matched sets when replacing. Do not attempt to replace one or two belts. Complete set must be replaced when any of the belts of a multiple belt drive fail.

Figures 16 and 17 show a special side wheel dresser available as extra equipment which can also be used to dress the face of the wheel.

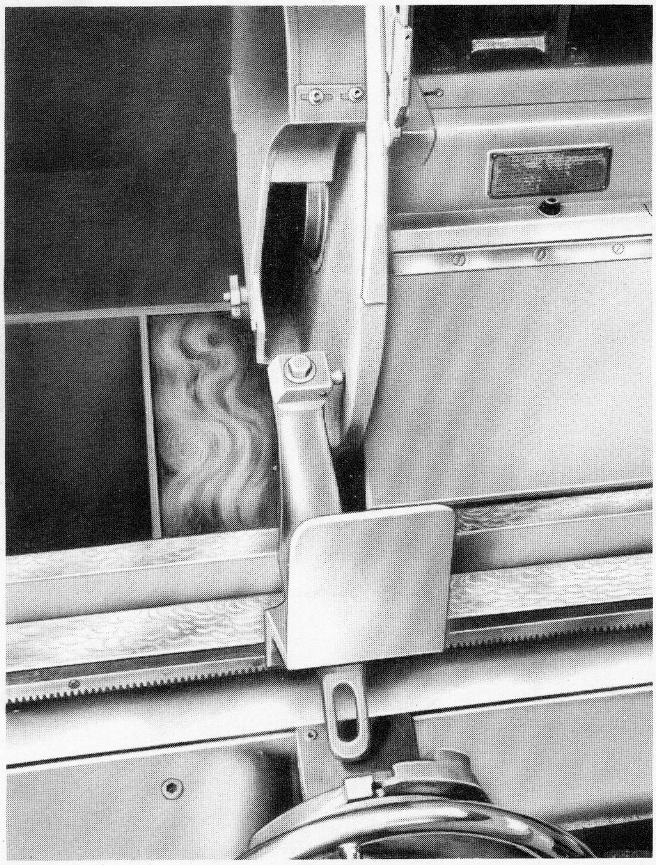


Figure 16

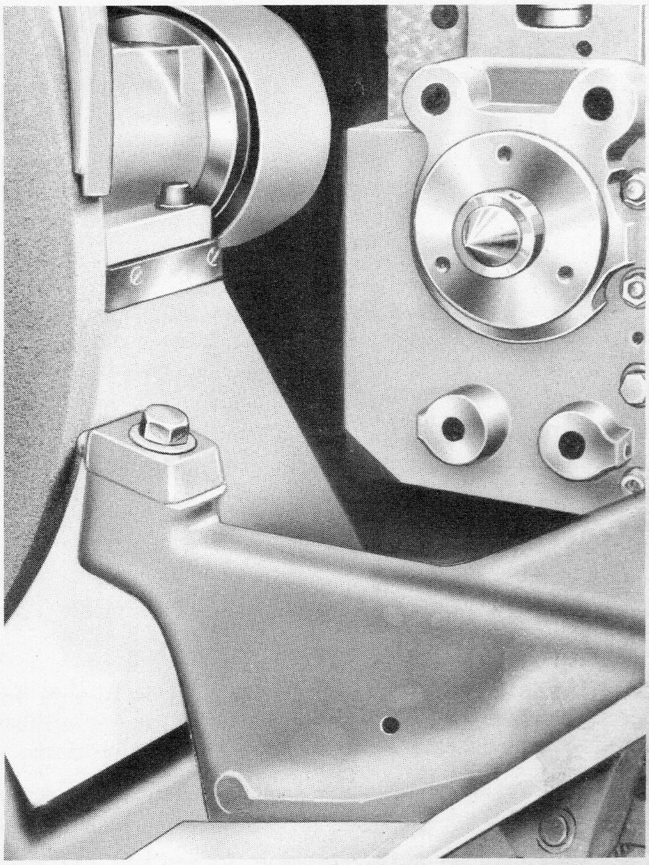


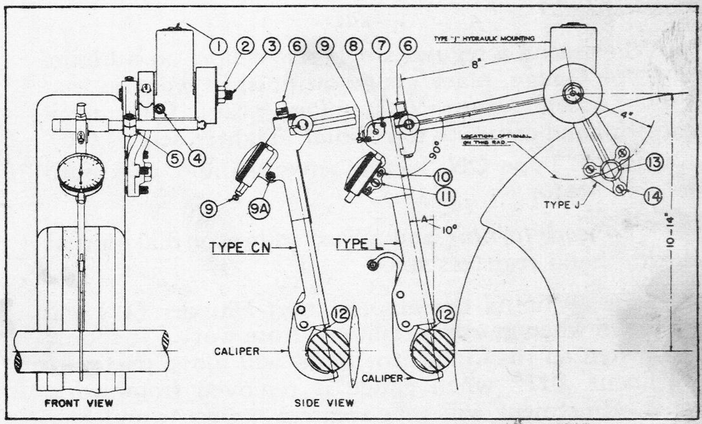
Figure 17

ARNOLD GAUGE OPERATION

1107—ARNOLD GAUGE OPERATION

INSTALLATION

Types "L" and "CN" With Type "J" Hydraulic Mounting



1. Place in grinding machine a piece of work that has already been ground to correct size and move grinding wheel up almost to work. Have wheel properly aligned with work to be ground.

2. To attach Type J Hydraulic Mounting, locate hole according to dimensions on drawing at right. These dimensions are approximate, but note carefully, that angle A

should be approximately 10° as shown. Drill and tap a ½″–13 hole in wheel guard for cap screw (13). If the gauge is too near vertical (in operating position), it will cause interference with coolant nozzle. (It is quite often necessary to set the nozzle at an angle for clearance.) Note also that the gauge should not be inclined too much toward the grinder operator, as this will cause the lower end of caliper to strike the grinding wheel. (This applies particularly to small diameter work.) Too large an angle at A also causes awkward working of the gauge for the operator and will locate the dial at an incorrect angle for easy reading.

3. Adjust three set screws (14) to make Gauge vertical and square with axis of work when looking at it from front and top, then tighten cap screw (13). This adjustment is important.

4. Adjust by sliding rod through end of arm (5, Front View) to bring Gauge in proper position on work.

5. Be sure that gauge caliper does not strike grinding wheel when Gauge is either on or off work.

ADJUSTMENT AND MAINTENANCE

Type "J" Hydraulic Mounting

ADJUSTMENT: This unit is adjusted and ready for operation when leaving the factory. If further adjustment becomes necessary, note the following directions.

1. To increase or decrease lifting speed, turn screw (4, Front View).

2. To adjust, lift spring tension, loosen nut (2), turn screw (3), and reset nut (2). Tension should be only slightly more than enough to carry weight of gauge. Too much tension will cause scoring of work and excessive wear.

MAINTENANCE: Keep Main Housing nearly full of oil at plug (1). Use a good grade of motor or machine oil (S.A.E., 20 gravity is recommended).

ADJUSTMENT AND MAINTENANCE

Types "L" and "CN" Gauges

ADJUSTMENT: Note: If Adjustable Caliper is used, set according to Adjustable Caliper instructions. (See opposite page.)

1. When using a regular single size caliper on a Model "L" Type Gauge, place gauge on finished work in machine. Loosen screws (10). Turn cam (11), until Indicator hand comes to top of dial. Tighten screws (10).

To adjust Type CN, loosen screw 9A and shift position of indicator.

2. *Start work turning* and adjust indicator dial so that indicator hand registers zero.

3. Screw 9 limits the amount that Plunger (12) will drop down when gauge is removed from work. It should be adjusted so that indicator hand will move past zero only about .011″ when gauge is removed from work. Proper adjustment will save wear to indicator and help to prevent grinder mud from working into gauge body around Plunger (12).

4. The Gauge is now ready for operation. Carefully measure each piece of work ground for a short time to make sure adjustments are correct and that gauge is working properly.

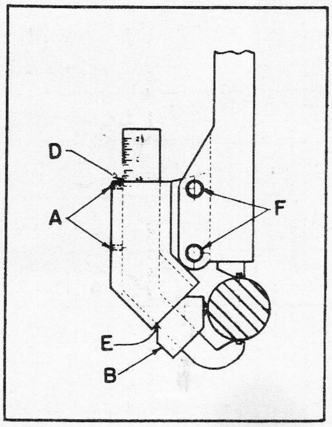
5. If Model "L" Gauge is being used and it becomes necessary to adjust Gauge plunger spring, loosen screws (7) and turn (8) for desired tension. *Too much tension will cause excessive indicator wear.*

(Above paragraph No. 5 does not apply to type "CN" which has no adjustment.)

MAINTENANCE: 1. Oil Gauge daily at (6) with a few drops of light oil; grinder spindle oil is satisfactory.

2. If Gauge becomes clogged or gummed up from disuse or improper oiling, *remove indicator* and wash gauge out with kerosene or gasoline.

ADJUSTMENT OF ADJUSTABLE CALIPER FRAMES



1. Loosen set screws (A) and (B).

2. Set by graduations at point (D) for approximate diameter and tighten set screws (A). Move back contact slide against body at (E) and tighten set screw (B). For final adjustment see Adjustment and Maintenance Type "L" and "CN" Gauges.

TO INTERCHANGE CALIPER FRAMES

1. Drive out split spring bushings at (F) using machine punch no larger than 23/64″ diameter. Tap bushings out lightly.

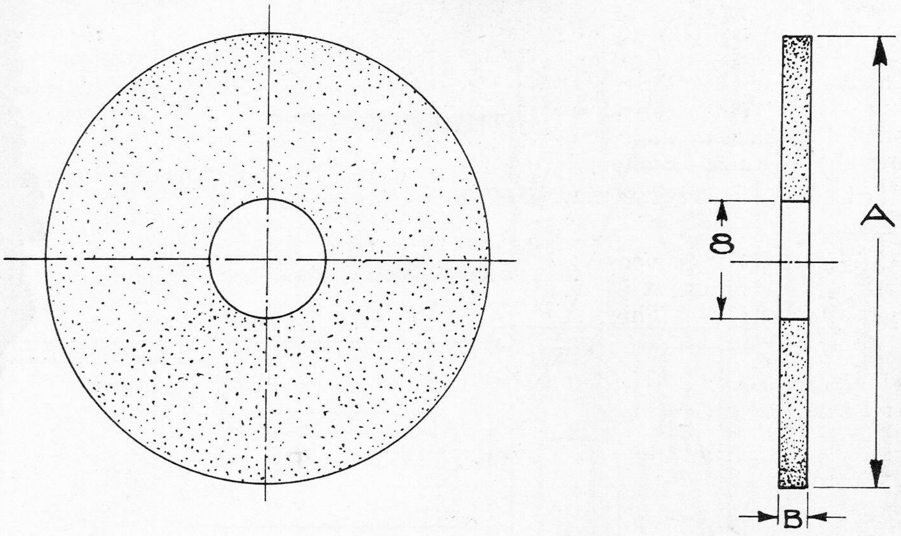
2. Pull Caliper out of slot in Gauge body.

3. Insert Caliper of desired size in slot and replace spring bushings using light hammer.

Note: Holes through Gauge body are slightly offset with holes in calipers. This enables spring bushings to hold calipers in positive position. *Do Not machine calipers to make holes line up.*

For service and repair parts on Arnold Gauge, contact Federal Products Corporation, Providence, R. I.

1108 . . WHEEL SPECIFICATIONS



-NOTE- Wheel width not exceed 2"
In ordering wheels specify 10" Blotters with 8" Hole

Order No	Diam A	Width B	Norton Co.	Carborundum Co.	Abrasive Co.	Type Crankshaft	
13848	28"	1"	A54-M5VBA	DA545 - N7 - V12	Borolon Vitrified A466-P5-V5	Standard	Carried In Stock
13849	28"	1½"	A54-M5VBA	DA545 - N7 - V12	Borolon Vitrified A466-P5-V5	Standard	Not Stocked
13850	28"	1	37C46-K5V	C36 - K4 - VE	Electrolon Vitrified C46-L7-V3	Metalized	Not Stocked
13851	28	1½	37C46-K5V	C36 - K4 - VE	Electrolon Vitrified C46-L7-V3	Metalized	Not Stocked

1109 . . STANDARD VAN NORMAN GUARANTEE

"Van Norman Products are backed by fifty years' experience in the manufacture of Precision Machine Tools. Every piece of merchandise bearing the name 'VAN NORMAN' is guaranteed to be not only free from defects in workmanship and material, but is guaranteed to properly perform the work for which it was designed.

"Carelessness on the part of the operator, misuse, abuse or negligence which in any way impairs the proper functioning of this equipment, automatically cancels any obligations of the Van Norman Company under this guarantee. If a machine is not functioning properly, repairs are to be made either at the factory or at authorized service stations or by our representatives. The addition of parts other than those manufactured by this Company or its supplier Companies automatically cancels this guarantee.

"Proper steps have been taken to provide protection against injuries to the operator of Van Norman equipment. This Company cannot be held responsible for any injuries sustained by the operator on any piece of Van Norman equipment nor responsible for any work which may be spoiled which is being done on any Van Norman machines."

The Van Norman Company manufactures not only the Nos. 400 — 666 and 111 Crankshaft Re-Grinders but a complete line of

- PISTON GRINDERS
- REAMER DRIVES
- VALVE SEAT GRINDERS
- BRAKE DRUM LATHES
- PER-FECT-O BORING BARS
- CLUTCH PLATE GRINDERS
- PISTON SKIRT RECHAMFERING MACHINES
- VALVE REFACERS
- VAN-A-LOY VALVE SEAT CUTTERS
- EXPANSION PILOTS
- CYLINDER HEAD GRINDERS
- CON-ROD BORERS AND GRINDERS

VAN NORMAN COMPANY

SPRINGFIELD 7, MASSACHUSETTS, U. S. A.

300- 7/53 N. E. B. Print Co.

Printed in U.S.A.

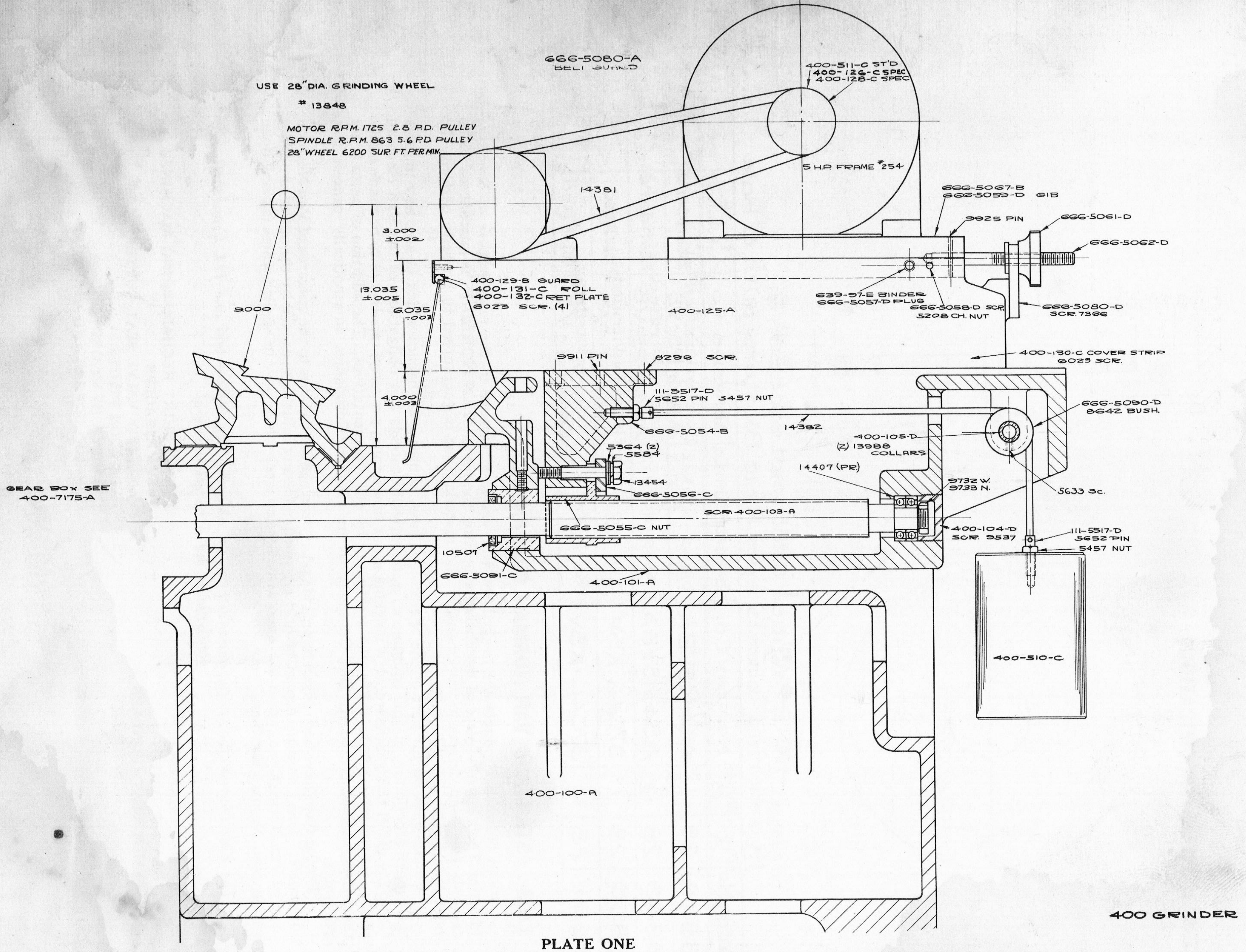


PLATE ONE

SIDE ELEVATION OF CROSS FEED SCREW

400 REGRINDER

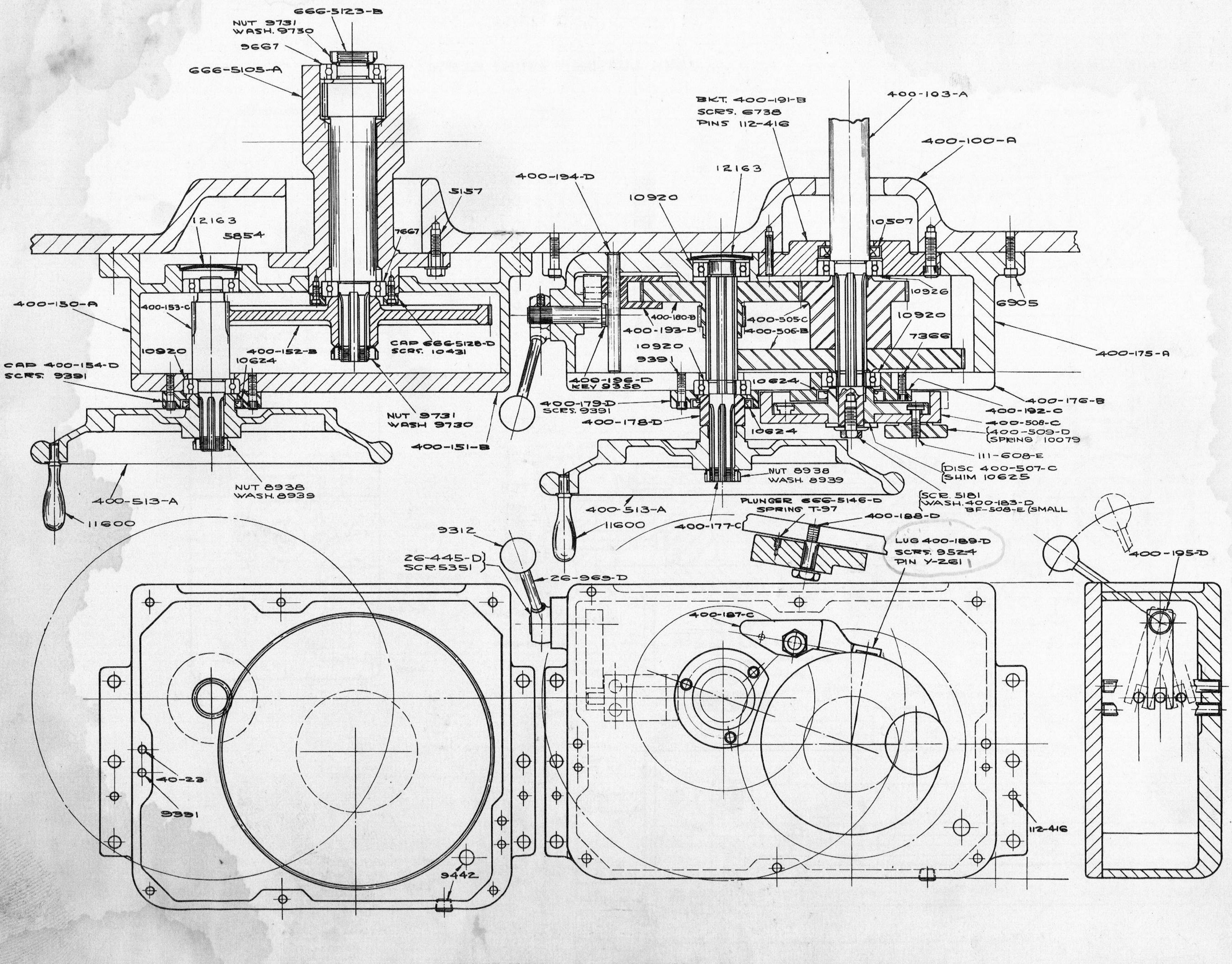


PLATE TWO — GEAR BOXES

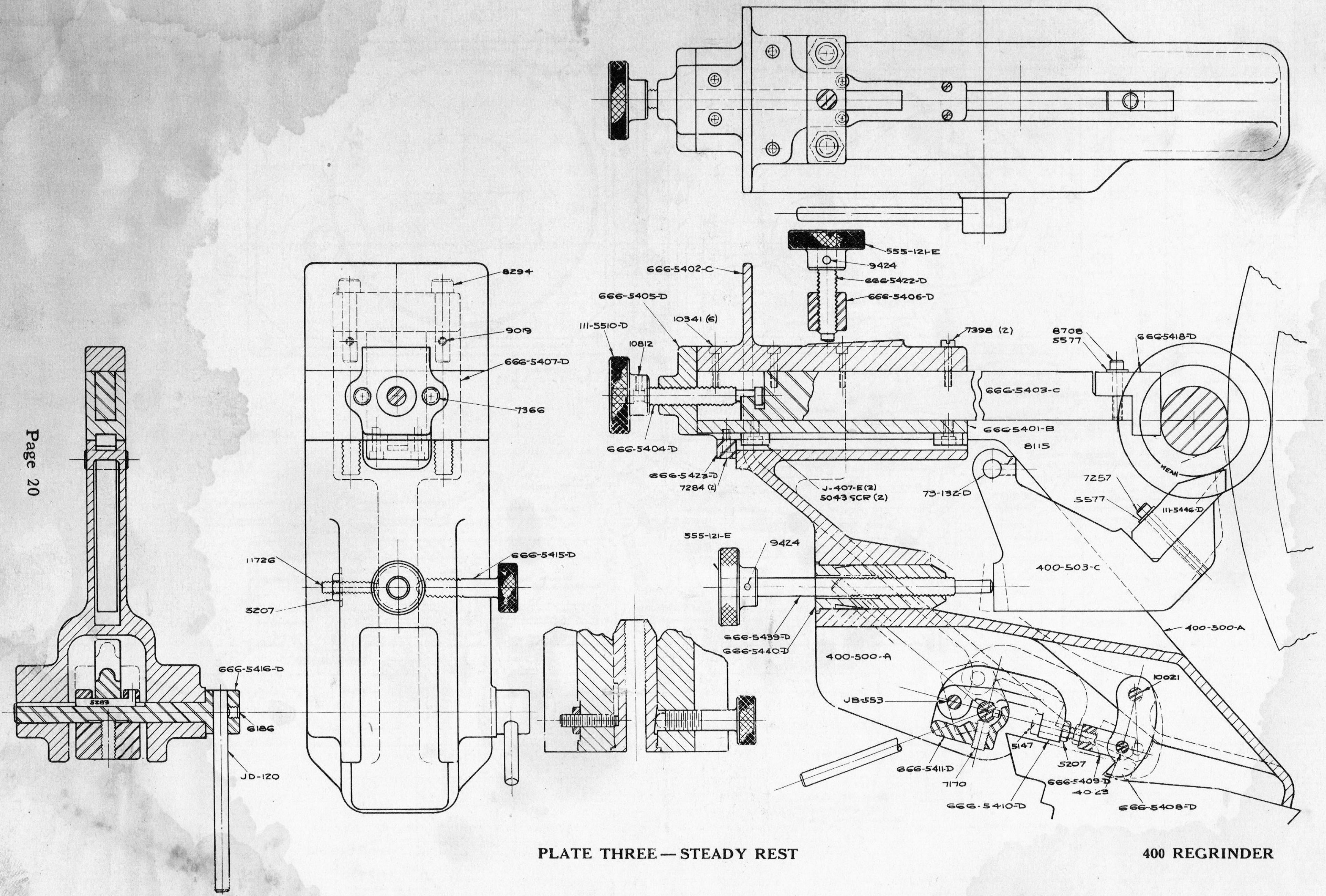


PLATE THREE — STEADY REST

VN VAN NORMAN
AUTOMOTIVE SERVICE EQUIPMENT

October 31, 1978

J-F Machine Diesel & Electronics
585 Pugh Rd.
Wayne PA 19087
[redacted]

Re: Parts for a #400 Crankshaft Regrinder

Dear Sir;

Enclosed is your request for information on tooling. We have placed part numbers and prices accordingly.

I suggest you call either myself or Ken Slicer should you need any additional information.

Part Number	Description	Price
666-75035	wheel balancing arbor	$153.00
14964	8" chuck inside	364.00
475-73620	side wheel dresser	203.00
448-70262	steady rest	779.00
14567	heavy duty diamond nib	38.40
400-07449	V blocks	OBSOLETE No Prints
666-05418	shoes	3.15
111-05446	shoes	3.15
475-07165	work drive dogs	534.00

Sincerely,

John S. Zanetti

John S. Zanetti
Parts Sales Administrator

JZ/gg

CC: K. Slicer

Quality is the Reason It Pays to Van Normanize
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